REMARKS

This amendment is being filed in response to the Office Action having a mailing date of January 24, 2006. Claims 1-3, 5, 8-11, 13, 16, and 18-21 are amended as shown. Claim 17 was previously cancelled. New claim 22 is being added herewith. No new matter has been added. With this amendment, claims 1-16 and 18-22 are pending in the application.

I. Objections

In the Office Action, the Examiner made several objections to the drawings, specification, and claims. These objections are addressed in turn below.

A. Objections to the drawings due to reference characters

In paragraph 1 on page 2 of the Office Action, the Examiner objected to the drawings for including various reference characters that were not mentioned in the description. It is respectfully submitted that the original description as filed does indeed describe the elements shown in the drawings. Nevertheless, the specification is amended as shown to explicitly mention the reference characters shown in the drawings and/or to otherwise conform the specification to the drawings. The amendments to the specification are being submitted herewith in the form of a redline Substitute Specification (highlighting the amendments) and a clean copy of the Substitute Specification. The Substitute Specification also incorporates the amendments to the specification that were made on August 19, 2005. No new matter has been added in the Substitute Specification.

B. Objections to the drawings due to features recited in the claims

In paragraph 2 on page 2 of the Office Action, the Examiner objected to the drawings for allegedly not showing certain features recited in the claims. Specifically, the Examiner stated that the "first soft-programming" and the "second soft-programming" in claims 1-15, and the "first soft-programming," the "second soft-programming," and the "third soft-programming" in claims 18-21 were not shown in the drawings. The applicants respectfully disagree with this assessment.

The first soft-programming is shown in block 200 in Figure 3. The second soft-programming is also shown in block 200 in Figure 3, after progressing through the block 260(yes), then to the block 270, then to the block 280, then to the block 290(no), then to the block 130, until reaching the block 200 again. The third soft-programming is shown also at the block 200 in Figure 3, after progressing through the block 290(no), then to the block 300, then to the block 310(no), then returning to the block 290(no), then to the block 130, until reaching the block 200 again.

C. Objections to the specification

In paragraph 3 on page 3 of the Office Action, the Examiner indicated that the description on page 2, lines 7-15 should be placed under the DETAILED DESCRIPTION OF THE INVENTION section. Through the Substitute Specification, the specification is amended in accordance with the suggestion by the Examiner.

Furthermore in paragraph 3 on page 3 of the Office Action, the Examiner indicated that the variable "a" (page 9, lines 11 and 19), "F" (page 9, lines 13 and 19), and "INT" (page 9, line 19) should be defined. The specification is amended as shown to clarify that "a" is a number between 0 and 100, since the original specification as filed indicates that "a" is a percentage %. It is respectfully submitted that the specification does not need to be amended to explicitly define "F" and "INT." A person skilled in the art having the benefit of the present disclosure would understand that "F" is a notation used to indicate a mathematical function, while "INT" is used to indicate an integer value.

D. Other objections to the specification

Also in paragraph 3 on page 4 of the Office Action, the Examiner requested the applicants to particularly point out where each of the features of claims 1-21 can be found in the description of the flowcharts in Figures 2-4, so as to help the Examiner understand the subject matter of the invention. For purposes of this discussion that follows, reference to specific pages and line numbers of the clean Substitute Specification filed herewith will be used.

Initially as an overview and as explained in the clean Substitute Specification on page 8, lines 14-19, one embodiment of the present invention is based on the idea that soft-

programming and verifying of memory cells in a memory device can be a multiplicity (for example, twice, such as 32 bits) of the number that are capable of being programmed (such as 16 bits) using the circuits and their current capability that are present on the memory device. Indeed, it may well be possible to soft-program and verify memory cells with a different multiplicity, such as three or four times or more times the number of cells that may be programmed during a programming operation, or with a same multiplicity of memory cells that may be programmed during a programming operation (*e.g.*, 16 bits programmed and 16 bits simultaneously soft-programmed).

The present inventors have recognized that in some situations the number of cells that need soft-programming may be a very small percentage, and substantially less than all of the memory cells on the memory device. The circuit currently present on the memory device can program simultaneously a plurality of memory cells, in the example given, 16 bits. During soft-programming, the goal is correct only those memory cells that are not at the correct erased state. Since, the inventors have recognized that the number of memory cells not at the correct erased stated will be only a small fraction of the total memory cells, a larger number than those cells that can be programmed simultaneously with the current carrying capability of the circuit can be soft-programmed simultaneously. Thus, as an example, if 16 memory cells are programmed, it is possible to soft-program simultaneously 16, 32, or 48, etc. pluralities of cells (*e.g.*, single, double, or triple, etc. multiplicities of memory cells, respectively). The pluralities of 16, 32, or 48, etc. cells that are simultaneously soft-programmed in this example are the "multiplicities" or multiples of the 16 cells that were programmed during the programming operation(s).

The "multiplicities" disclosed by the present applicants are thus referring to "multiplicities" of "memory cells." Embodiments pertaining to soft-programming simultaneously a plurality of memory cells according to various multiplicities are disclosed in Figures 1-3 of the present application, such as the registers SPX32 and SPX16 where the "multiplicity" is currently stored, and the blocks 100, 200, 270, 320, 250, 420, etc. that describe and pertain to soft-programming simultaneously a plurality of memory cells according to a multiplicity. Indeed, an advantage of performing simultaneous soft-programming on a multiplicity of memory cells is to exploit parallelism, so that multiple memory cells can be soft-programmed quickly and efficiently.

To further explain an embodiment disclosed by the present applicants: 32 cells are soft-programmed (an example of a "first soft-programming multiplicity"). If after a certain number of attempts the cells are not yet sufficiently soft-programmed, the 32 cells are divided into two sets of 16 cells each (an example of a "second soft-programming multiplicity"), which will be soft-programmed in two successive steps. By dividing the first multiplicity of 32 cells into the smaller multiplicity of two sets of 16 cells, the appropriate amount of current for the soft-programming operations can be supplied, without the need to increase the dimensions of a charge pump inside the memory device. An algorithm provided by one of the applicants' embodiment thus is able to select a lower multiplicity in such a way that the existing charge pump is able to supply the requisite amount of current. *See, e.g.*, page 8, lines 17-19 of the Substitute Specification.

The following detailed references to the specification are provided below to help assist the Examiner in understanding the subject matter of the applicants' claims--again, it is appreciated that such discussion and references to the specification is being provided merely for illustrative and explanatory purposes and are not being used to define the scope or interpretation of the claims:

Claim 1 (as amended): "performing a first soft-programming with a first soft-programming multiplicity of memory cells in given operating conditions that are based on a maximum current which is available for writing operations and which can be generated within the memory device ..." *See, e.g.*, page 8, lines 14-19; page 14, lines 24-25; page 11, lines 1-9 (discussing block 100 in Figure 2 and setting the first soft-programming multiplicity to 32 cells, for example); and page 11, line 20 through page 12, line 9 (discussing block 200 in Figure 3 and performing the first soft-programming of the 32 cells) of the Substitute Specification.

Claim 1 (as amended, continued): "performing a second soft-programming of memory cells with a second soft-programming multiplicity differing from the first soft-programming multiplicity in a case where depleted memory cells are still present among the first plurality of memory cells after said first soft-programming ..." *See, e.g.*, page 12, lines 15-20 (discussing block 240 in Figure 3 and determining whether there are any depleted cells among the 32 cells); page 12, line 24 through page 13, line 4 (discussing block 270 in Figure 3 in which the second soft-programming multiplicity is set/forced to 16 memory cells); and page 13, lines

10-12 (discussing blocks 280 and 130 in Figure 3, which involve soft-programming the depleted cells of the second soft-programming multiplicity) of the Substitute Specification.

Claim 1 (as amended, continued): "the second soft-programming multiplicity corresponding to simultaneous soft-programming of a second plurality of memory cells of the memory device, said first and second soft-programming being performed without increasing said maximum current which is available for writing operations and which can be generated within the memory device." *See, e.g.*, page 8, lines 14-19; page 14, lines 24-25 of the Substitute Specification.

Claim 2 (as amended): "said first soft-programming multiplicity is greater than a programming multiplicity of memory cells used for writing data in the memory device." *See, e.g.*, page 8, lines 14-17 and the corresponding discussion in Figures 2-3 in the Substitute Specification.

Claim 3 (as amended): "said first soft-programming multiplicity is twice than a programming multiplicity of memory cells used for writing data in the memory device." *See, e.g.*, page 8, lines 14-17; page 8, lines 20-23; and the corresponding discussion in Figures 2-3 in the Substitute Specification.

Claim 4: "said second soft-programming multiplicity is smaller than said first soft-programming multiplicity." *See, e.g.*, page 8, line 25 through page 9, line 2 and the corresponding discussion in Figures 2-3 in the Substitute Specification.

Claim 5 (as amended): "second soft-programming multiplicity is smaller than said first soft-programming multiplicity ..." *See, e.g.*, page 8, line 28 through page 9, line 2 and the corresponding discussion in Figures 2-3 in the Substitute Specification.

Claims 6-8: *See, e.g.*, page 8, line 25 through page 9, line 2 and the corresponding discussion in Figures 2-3 of the Substitute Specification.

Claims 9-16: see discussion above pertaining to claims 1-8.

Claim 18 (as amended): "performing a first soft-programming of a first plurality of memory cells simultaneously." *See, e.g.*, page 11, lines 1-9 (discussing block 100 in Figure 2 and setting the first soft-programming multiplicity to 32 cells, for example); and page 11, line 20 through page 12, line 9 (discussing block 200 in Figure 3 and performing the first soft-programming of the 32 cells) of the Substitute Specification.

Claim 18 (as amended, continued): "performing a second soft-programming of a second plurality of memory cells simultaneously that is fewer than the first plurality of memory cells if a current needed for the first soft-programming is equal to or greater than a maximum current that can be generated during a programming operation." *See, e.g.*, page 8, line 25 through page 9, line 2; page 12, lines 15-20 (discussing block 240 in Figure 3 and determining whether there are any depleted cells among the 32 cells); page 12, line 24 through page 13, line 4 (discussing block 270 in Figure 3 in which the second soft-programming multiplicity is set/forced to 16 memory cells); and page 13, lines 10-12 (discussing blocks 280 and 130 in Figure 3, which involve soft-programming the depleted cells of the second soft-programming multiplicity) of the Substitute Specification.

Claim 18 (as amended, continued): "performing a third soft-programming of a third plurality of memory cells simultaneously that is equal in number to the first plurality of memory cells if the current needed for the first-soft programming is less than the maximum current." *See, e.g.*, page 12, lines 21-24 (discussing block 250 after performing block 320, wherein the multiplicity is reset to 32 memory cells at the block 250 so that the soft-programming can move to the next row in block 140 in Figure 2) of the Substitute Specification.

Claims 19-21 and new claim 22: see prior discussions above.

E. Objections to the claims

In paragraph 4 on page 4 of the Office Action, the Examiner made several claim objections due to various informalities. Each of these claim objections is addressed in turn below:

Claim 1 is amended to better define the "given operating conditions." Specifically, claim 1 is amended to recite that the operating conditions --are based on a maximum current which is available for writing operations and which can be generated within the memory device--.

Claims 1-7 and 9-14 were objected to because they did not define whether the recited "multiplicity" is a "multiple number of times" or "memory cells." Claims 1-3, 5, 9-11, and 13 are amended as shown to clarify that the recited "multiplicity" refers to "memory cells."

Claims 2-3, 5, 10-11, and 13 are amended to provide proper antecedent basis for the (previous) recitation of "that used for writing data in the memory device." For example, claim 2 is amended to recite "a programming multiplicity of memory cells used for writing data in the memory device."

Claim 9 is amended to better define the "given operating conditions." Specifically, claim 9 is amended to recite that the operating conditions --are based on a maximum current which is available for writing operations and which can be generated within the memory device--.

Claim 18 is amended to replace the "threshold amount" language with other language, thereby making moot the informality noted by the Examiner. Claim 20 is amended to be consistent with this amendment to claim 18, as well as to add additional recitations.

Claim 19 is amended to clarify that the recited "32" and "16" quantities are both referring to memory cells.

Claim 21 is amended to address the antecedent basis issue with regards to the "power capability" recitation.

II. Discussion of the Claims and the Cited Reference

In the Office Action, the Examiner rejected claims 1-21 under 35 U.S.C. § 102(b) as being anticipated by Lu (U.S. Patent No. 6,363,013). It is noted that since claim 17 was previously canceled, claim 17 is thus no longer pending and should not have been included among the list of rejected claims. In view of the amendments to the claims and the arguments below, it is respectfully submitted that this rejection is overcome.

Specifically, independent claim 1 as amended recites, *inter alia*, "performing a first soft-programming with a first soft-programming multiplicity of memory cells in given operating conditions that are based on a maximum current which is available for writing operations and which can be generated within the memory device ..." This amendment to claim 1 is derived from language that is contained in claim 8. It is noted that the Examiner did not specifically point out in the Office Action a teaching in Lu that anticipates the recitations of claim 8. It is respectfully submitted that Lu does not disclose, teach, or suggest this feature, which is now also contained in claim 1.

Specifically in Lu, the operating conditions refer to the threshold of the transistor and not to a maximum current which is available for writing operations and which can be generated within the memory device, as recited in claim 1. *See, e.g.*, column 3, lines 48-53 of Lu. Indeed, the Examiner has admitted on page 5 of the present Office Action (in rejecting claims 6-7 and 14-16) that the threshold voltage used in Lu's soft-programming is associated with his threshold current. Accordingly, claim 1 is allowable.

Claim 1 is further amended to recite performing the second soft-programming where --depleted memory cells are still present among the first plurality of memory cells after said first soft-programming--. Nowhere does Lu disclose, teach, or suggest this feature. For example, Figure 2 of Lu shows soft-programming of 10 cells in an operating condition where the threshold voltage is 0 volts. However, there is nothing in Lu to indicate that this soft-programming of the 10 cells is performed in a case "where depleted memory cells are still present among the first plurality of memory cells after said first soft-programming," as recited in claim 1. Indeed, Figure 2 of Lu merely shows a distribution of cells based on different threshold voltages, and does not tie or otherwise relate the distribution of cells between first and second soft-programmings in a manner recited in claim 1 (*e.g.*, performing the second soft-programming where "depleted memory cells are still present among the first plurality of memory cells after said first soft-programming"). Accordingly, claim 1 is further allowable over Lu.

Claim 1 is also amended to recite --said first and second soft-programming being performed without increasing said maximum current which is available for writing operations and which can be generated within the memory device--. Lu does not provide this feature. Lu simply mentions a current source 50 (shown in Figure 8) that provides current for hot electron injection for soft-programming and that is connected to the drains of the cells. *See, e.g.*, column 5, line 67 through column 6, line 14 of Lu. The current source 50 of Lu is dependent on the architecture of the memory array (*see, e.g.*, column 6, lines 27-29 of Lu). Therefore, if Lu has N memory cells, the current source 50 provides soft-programming current for N memory cells. Lu would have to increase the size (or replace) the current source 50 if a larger multiplicity such as 2N, 3N, etc. of memory cells is to be soft-programmed, since a different/higher current output is needed. Accordingly, Lu does not meet the limitations of claim 1 that recite "said first and

second soft-programming being performed without increasing said maximum current ..." Accordingly, claim 1 is yet further allowable over Lu.

Independent claim 9 is amended to include some recitations similar to claim 1 discussed above. For example, claim 9 is amended to recite --the second soft-programming multiplicity ... being performed in a case where depleted memory cells are still present among the first plurality of memory cells after said first soft-programming--. Claim 9 is also amended to recite that the operating conditions --are based on a maximum current which is available for writing operations and which can be generated within the memory device--. As explained above, these features are not found in Lu.

For example, Lu does not perform a second soft-programming based on a result of a first soft-programming in a manner recited in claim 9. Also, Lu's soft-programming current from the current source 50 is based on the architecture of his memory cells for hot electron injection for soft-programming, and is not based on a maximum current available for writing operations, as recited in claim 9. Accordingly, claim 9 is allowable.

Independent claim 18 is amended to recite, *inter alia*, "performing a second soft-programming of a second plurality of memory cells simultaneously that is fewer than the first plurality of memory cells if a current needed for the first soft-programming is equal to or greater than a maximum current that can be generated during a programming operation." As explained above, Lu does not disclose, teach, or suggest performing a second soft-programming based on any sort of condition related to a first soft-programming. Therefore, claim 18 is allowable.

New dependent claim 22 recites performing the second soft-programming if depleted memory cells among the first plurality of memory cells are present after performing the first soft-programming. Again, Lu does not disclose, teach, or suggest such conditions for performing a second soft-programming. Therefore, claim 22 is allowable.

III. Conclusion

Overall, none of the references singly or in any motivated combination disclose, teach, or suggest what is recited in the independent claims. Thus, given the above amendments and accompanying remarks, the independent claims are now in condition for allowance. The dependent claims that depend directly or indirectly on these independent claims are likewise

allowable based on at least the same reasons and based on the recitations contained in each dependent claim.

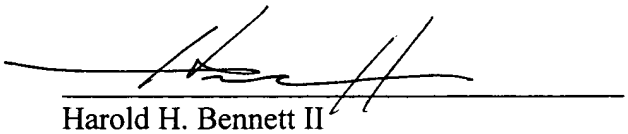
If the applicants' attorney (Dennis M. de Guzman) has overlooked a teaching in any of the cited references that is relevant to the allowability of the claims, the Examiner is requested to specifically point out where such teaching may be found. Further, if there are any informalities or questions that can be addressed via telephone, the Examiner is encouraged to contact Mr. de Guzman at (206) 622-4900.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

SEED Intellectual Property Law Group PLLC



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Enclosures:
Petition for Extension of Time
Redlined Substitute Specification
Substitute Specification

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